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China, India, and the Future of the World Economy:

Fierce Competition or Shared Growth?

Betina Dimaranan
Elena Ianchovichina
Will Martin

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Trade Team
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Abstract

Although both China and India are labor-abundant and dependant on manufactures, their export mixes are very different. Only one product—refined petroleum—appears in the top 25 products for both countries, and services exports are roughly twice as important for India as for China, which is much better integrated into global production networks. Even assuming India also begins to integrate into global production chains and expands exports of manufactures, there seems to be opportunity for rapid growth in both countries. Accelerated growth through efficiency improvements in China and India, especially in their high-tech industries, will intensify competition in global markets leading to contraction of the manufacturing sectors in many countries. Improvement in the range and quality of exports from China and India has the potential to create substantial welfare benefits for the world, and for China and India, and to act as a powerful offset to the terms-of-trade losses otherwise associated with rapid export growth. However, without efforts to keep up with China and India, some countries may see further erosion of their export shares and high-tech manufacturing sectors.

This paper—a joint product of the Trade Team in the Development Research Group and the Economic Policy Group in the Economic Policy and Debt Department —is part of a larger effort in the department to understand the implications of the growth of China and India for other developing economies. Policy Research Working Papers are aposted on the Web at http://econ.worldbank.org. The authors may be contacted at b.dimaranan@cgiar.org, eianchovichina@worldbank.org, or wmartin1@worldbank.org.

China, India, and the Future of the World Economy: Fierce Competition or Shared Growth?

by

Betina Dimaranan, Elena Ianchovichina and Will Martin*

World Bank

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* Will Martin is Lead Economist, Development Research Group at the World Bank; his email address is wmartin1@worldbank.org. Elena Ianchovichina is Senior Economist, Economic Policy and Debt Department at the World Bank; her email address is eianchovichina@worldbank.org. Betina Dimaranan is Research Fellow, IFPRI-MTID; her email address is b.dimaranan@cgiar.org. We would like to thank Alan Winters, Shahid Yusuf, Yasheng Huang, T.N. Srinivasan, and participants in the 10th Annual Conference on Global Economic Analysis at Purdue University for helpful comments on earlier drafts. The findings, interpretations and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.

China, India, and the Future of the World Economy: Fierce Competition or Shared Growth?

The rapid economic growth of China and India has been associated with much more rapid growth in their trade. In some cases, this has created enormous opportunities for their trading partners. In others, it has created strong competition either in home markets, or in third markets. Those who face increases in competition are frequently more vocal, but a balanced assessment is needed to help develop appropriate policy responses. If some countries lose from increased competition, as found by Freund and Ozden (2006) and Hanson and Robertson (2006), which countries and which industries will face the most serious competition? And where will the largest opportunities be found?

A key determinant of the distributional implications of global competition is the extent to which countries' baskets of goods overlap. Traditional trade models where comparative advantage follows from countries' relative endowments imply that extremely labor-abundant countries like China and India will manufacture and export labor-intensive goods, while skill- and capital-abundant developed countries will specialize in skill- and capital-intensive products. According to these models, developed economies have little reason to be concerned by the emergence of China and India as global economic powers. However, other labor-abundant developing economies have much to lose as traditional theory highlights expansion of existing products (the intensive margin) as the only source of export growth.

Many of these expectations about the potential impact of the expansion of exports from China and India may be biased or exaggerated. The expansion of China and India's trade is quite different from the expansion of developing country exports considered in much of the development literature. It involves, for instance, two-way trade in manufactures *and* services, which make the recipient countries the beneficiaries of improvements in efficiency in their trading partners (Martin 1993). It also involves fragmentation and global production sharing, where part of the production process is undertaken in one economy, and subsequent stages are undertaken in another (Ando and Kimura 2003; Gaulier, Lemoine and Unal-Kesenci 2004). This makes participants in this process beneficiaries from, rather than victims of, improvements in the competitiveness of their partners. And new trade theory now recognizes that export expansion does not involve just increases in exports of the same products. Rapidly growing

economies expand the range of products they export, improve product quality, and export to additional markets as their exports grow (Evenett and Venables 2002; Hummels and Klenow 2005).

Complicating the analysis is the fact that, while both China and India are more labor-abundant than developed economies, relative factor endowments and income levels vary substantially across regions within these economies. China's coastal areas may place it in a different category compared to the much more labor-abundant inland provinces. This heterogeneity can influence the range of goods China produces and exports, and therefore helps explain the disproportionate similarity of China's export bundle with that of the developed countries (Schott, 2007). India's large number of skilled workers also implies that there may be a lot more competition between India and developed economies than suggested by its relative endowment shares.

Much can be learned by examining China's and India's trading patterns. Although it turns out that both have been quite successful in expanding their exports and imports, they have done this in *very* different ways. Broadly, China has relied primarily on exports of manufactures, frequently as part of an East Asian production sharing network. By contrast, India has concentrated more heavily on services. Within manufactures, China has relied heavily on exports of finished goods, while India has focused much more on exports of intermediate inputs. India's exports are frequently of capital- and skill-intensive goods, while China has emphasized exports of labor-intensive goods — although these are increasingly sophisticated (Rodrik 2006). Indeed recent research suggests that China's export bundle overlaps with that of developed countries much more substantially than one would expect given either its level of development or its size, and this excess similarity has increased with time (Schott 2007). China's rank in terms of the similarity of its export bundle with the OECD jumped from nineteen in 1972 to four in 2001. No other country's growth in product penetration comes close to the increase observed for China. Quality differences between Chinese and developed country exports however suggest that competition between China and developed countries may not be as direct as suggested by the overlap of their export baskets.

Although China and India do not appear to be in direct competition, reforms under way in India may intensify competition between them as well as intensify competition between these two giants and the rest of the world. Accelerated growth in China and India may create opportunities for some and threaten

others and the outcomes may differ depending on whether this growth is accompanied by quality improvements and variety expansion, and whether it is driven by physical or capital accumulation. Who will win and who will lose from these developments? We undertake the analysis in this paper with these questions in mind.

No analysis of potential future developments can reliably be undertaken without an examination of the key features of the current situation, and how it arose. Therefore, this paper first reviews some key features of China's and India's trade, in particular, the recent rapid export growth; the changing relative importance of goods and services; and the changing composition of exports within merchandise and services. With this as background, we use a global economy-wide modeling approach to take into account all of the potential impacts of a number of policy reforms and likely scenarios. First, the implications of the reforms under way in India are examined to see if they might result in greater competition between China and India. Then, we generate a baseline and examine the potential global implications of higher-than-expected growth rates in these two economies. We consider first the impact of more rapid economy-wide growth in China and India. We then examine the implications of two different types of growth, first growth focused on relatively sophisticated products, and subsequently growth driven by increased accumulation of physical and human capital.

Unlike other approaches used to analyze these issues,[1] the global applied general equilibrium model used in this paper ensures consistency while including important industry detail – each region's exports of particular goods equal total imports of these goods into other regions (less shipping costs); global investment equals the sum of regional savings; regional output determines regional income; global supply and demand for individual goods balance; and in each country/region demand for a factor equals its supply. These accounting relationships and the behavioral linkages in the model constrain the outcomes in important ways not found in partial equilibrium analyses—increased exports from one country must be accommodated by increased imports by other countries; broad-based increases in

[1] At the time this analysis took place there were no papers that used a global applied general equilibrium model to study the implications of China's and India's growth on global trade. More recently, McDonald, Robinson and Thierfelder (2007) employed a global AGE model to analyze the impact of the dramatic expansion of trade by India, China and the developing East and Southeast Asia. Their findings are consistent with ours although they do not investigate the impact of India's increased integration into the global economy, alternative growth scenarios, and the impact of growth at the extensive and quality margins. Instead they focus on a 10 percent improvement in total factor productivity in the value added function of non-agricultural sectors in China, India and developing Asia and the effect of regional trade agreements in East Asia on the rest of the world.

productivity that raise competitiveness also raise factor prices and help offset the original increase in competitiveness.

Developments in Trade

China and India have grown relatively rapidly in recent years, and, in both, the importance of trade has risen substantially relative to GDP. Although both of these large, low-income countries had very low export-to-GDP ratios around 1980, when the process of reform was beginning in China (Srinivasan 2004), since then both have increased their exports sharply, although India's export growth has been much more modest than China's (Figure 1).[2] From the mid-1990s, as the export processing arrangements were broadened beyond the initial special economic zones in China,[3] the share of exports in China's GDP began to climb sharply. With the sharp devaluation of the official exchange rate in 1994, the share of exports in GDP rose, but then stabilized or declined in the mid-1990s. From 2001 to 2004, China's export share rose dramatically, to around 40%, over two and a half times India's export share. Even the upward revision to GDP of 17 percent in 2004 (see World Bank Office, Beijing 2006) leaves China's export share at 31%, more than double India's level.

China's export growth has been accompanied by tremendous growth in product variety. While China was present in 9 percent of all manufacturing product categories in 1972, it was present in 70 percent of categories by 2001 (Schott 2007). The quality gap between China and the developed countries has been increasing with time in some industries suggesting that developed economies might be responding to competition from China and other low-wage countries by raising the sophistication of their exports or dropping the least-sophisticated varieties from their export bundle.

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[2] China's trade volume is much larger than India's, but the cost of switching trade flows away from China are much lower than those of India. This is the case because China supplies mostly modular production – i.e. components that can be added on or off with ease (Steinfeld 2002), while India supplies customized and some "mission critical" services to multination corporation – i.e. operations with extremely high switching costs.

[3] The export processing arrangements included duty exemptions on imports used for the production of exports. These exemptions were offered to foreign invested enterprises that initially were located in special economic zones in the southern coastal regions of China, but were subsequently broadened to a wide range of enterprises (World Bank 1994) which typically did not receive the economically questionable and (now WTO-inconsistent) income-tax concessions traditionally available in the zones.

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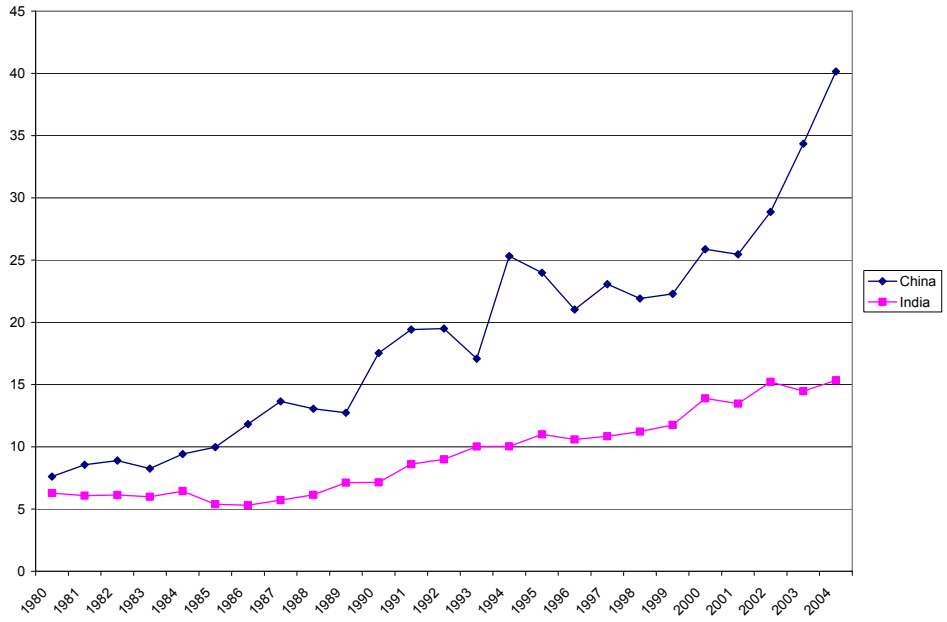
Figure 1. Exports of Goods and Nonfactor Services as a Share of GDP, %

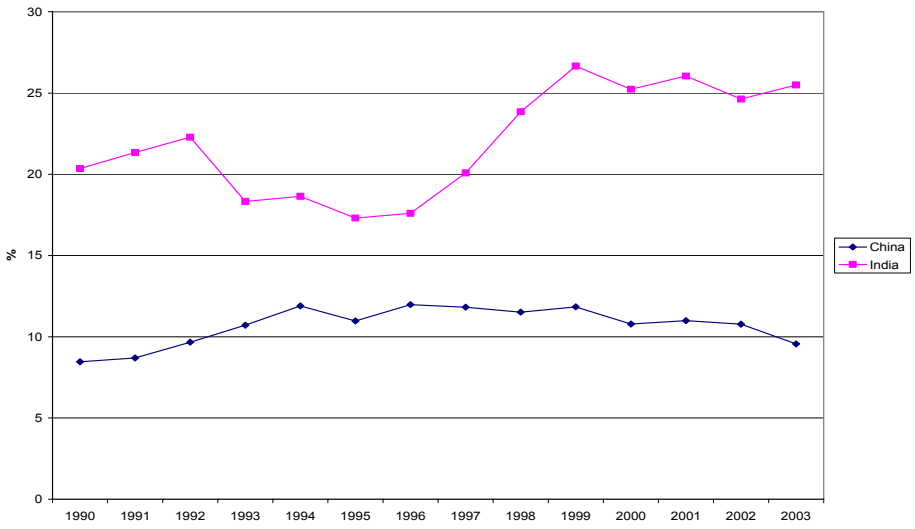


Source: World Bank, World Development Indicators database.

Exports of Services

A striking difference between China and India is in the importance of services relative to merchandise exports. India's share of commercial services in total goods and services exports has been much higher than China's, not just since the rapid expansion of exports of computing services around 2000, but for the entire period since 1992 during which comparable estimates are available (Figure 2). The share of services in India's exports began, at around 20 percent, over twice as high as China's. This share declined in India until the late 1990s, when it again began to rise sharply. Since 2000, services have accounted for over a quarter of India's exports, while the share of services in China's exports has declined to under 10 percent of total exports—although China's exports of services have been growing rapidly in absolute terms.

Figure 2. The share of commercial services in total exports, %



Source: World Bank, World Development Indicators database.

There have also been sharp changes in the composition of services exports as noted in Dimaranan, Ianchovichina and Martin (2006). In India, the main development was a dramatic increase in the importance of communications and computing services, from approximately 40 percent of all services exports in 1990 to roughly two-thirds in recent years. In China, travel and tourism services rose from a little more than 20 percent of all services exports in 1990 to approximately 50 percent in 2002. In 2003, the share of travel and tourism declined, while the share of communication and computing services expanded from about 25 percent to more than 50 percent.

Merchandise Trade

Although both China's and India's merchandise exports are dominated by manufactures (World Bank 2003) the composition of these manufactures and the approach to their production differs considerably. For the purpose of discerning these differences we look at information on export and import patterns for each country using data by stage of production from the United Nations' Broad Economic Classification (BEC) system (Table 1). Because of the very different importance of fuel imports and exports to the two countries, we discuss only non-fuel products.

If we look first at the import data for 2004, we find that 63 percent of China's non-fuel imports are of manufactured intermediate inputs, while these account for 60 percent of India's imports. Only when we

consider imports of parts and components do we see the sharp distinction between the two countries that might be expected given the discussions on global production sharing. These accounted for 31 percent of China's merchandise imports, as against only 12 percent in India.

On the export side, the two countries differ substantially in the importance of final goods in their exports. While 61 percent of China's non-fuel exports are classified as final goods, only 40 percent of India's exports are final goods, with 52 percent intermediate manufactured goods, and 8 percent non-fuel primary products.

Between 1992 and 2004, the major change evident is the dramatic increase of China's trade in parts and components. In 1992, these accounted for only 15 percent of non-fuel imports, but this share rose to 31 percent by 2004. By contrast, in India, this share declined from 15 to 12 percent. While discussions of China's role in production networks tend to focus on China's role as an importer of components, it is notable that there has also been a substantial increase in the importance of parts and components in China's exports, with this share rising from 5 to 15 percent. By contrast, in India, this share rose from 5 to just 6 percent of total non-fuel exports. These data are consistent with the widespread perception that India remains much less integrated than China in global production networks, despite the existence of Indian policies to allow duty-free access to imported components for use in the production of exports (World Bank 2004).

Table 1. Composition of Non-fuel Imports and Exports by Broad Economic Classification

	China		India	
	Imports	Exports	Imports	Exports
2004				
Nonfuel Primary Inputs	10	1	16	8
Intermediate inputs	63	38	60	52
Final Goods	28	61	25	40
Total	100	100	100	100
Parts/components	*31*	*17*	*12*	*6*
1992				
Nonfuel Primary Inputs	8	6	30	6
Intermediate inputs	61	30	55	47
Final Goods	31	65	15	47
Total	100	100	100	100
Parts/components	*15*	*5*	*15*	*5*

Source: UN COMTRADE statistics from the World Bank WITS system.

As Hausman and Rodrik (2003) have emphasized, different countries' exports reflect a wide range of differences in trade regimes, as well as idiosyncratic factors that lead apparently similar countries to have very different product mixes at the finer levels of disaggregation. The top 25 exports of China and India for 2004, at the six-digit level of the Harmonized system (HS), which account for 58.4 percent of India's merchandise exports, and 38.4 percent of China's turn out to be almost mutually exclusive sets. Only one product—refined petroleum - enters both lists, accounting for over 9 percent of India's exports and 0.9 percent of China's. A notable feature of China's list is the prominence of computer and electronic equipment products under Chapters 84 and 85. These two chapters (which also include non-electronic equipment) alone accounted for almost 42 percent of China's exports in 2004, up from 16 percent in 1994. In India, three HS products under Chapter 71 (diamonds and jewelry) and refined petroleum under Chapter 27 likewise accounted for 28 percent of total exports.

Methodology and Simulation Design

The preceding discussion of trade patterns provides valuable background, but does not allow us to assess the implications of high growth in China and India and increased competition between China and India as India implements reforms that speed up its integration into global production networks. To do this, we use a modified version of the standard GTAP model.[4] The model emphasizes the role of intersectoral factor mobility in determining sectoral output supply. Product differentiation between imported and domestic goods, and among imports from different regions, allows for two-way trade in each product category, depending on the ease of substitution between products from different regions. Factor inputs of land, capital, skilled and unskilled labor, and in some sectors a natural resource factor, are included in the analysis. The model includes the explicit treatment of international trade and transport margins, a "global" bank designed to mediate between world savings and investment, and a relatively sophisticated consumer demand system designed to capture differential price and income responsiveness across countries.

The constant returns to scale version of the GTAP model was adjusted to incorporate China's duty exemptions—which have been a key reason for the rapid integration of China into global production

[4] This applied general equilibrium model is documented comprehensively in Hertel (1997) and in the GTAP Data Base documentation (Dimaranan 2006).

networks-- and to allow analysis of the impact of an effective system of duty exemptions for inputs used in the production of exports in India. Duty exemptions were incorporated in the GTAP model and data base following the methodology developed by Ianchovichina (2004). This duty exemption model allows for two separate activities in each industry. Production of exports is represented as an activity for which imported intermediate inputs are available duty-free. Production for the domestic market uses the same technology, but requires payment of duties on intermediate inputs. Firms engaging in production for either the domestic market or the export market purchase both imported and domestic intermediate inputs which are imperfect substitutes following the Armington structure. Ianchovichina (2004) documents the approach used to introduce duty exemptions into the GTAP model and shows that failing to account for duty exemptions introduces bias in trade liberalization outcomes in countries with such a system.

The 57 sectors and 87 regions of the GTAP 6 Data Base were aggregated into 26 sectors (Table 2) and 24 regions (Table 3) based on the importance of these sectors and regions in China's and India's trade patterns. To start, we used historical and projected growth rates for GDP, skilled labor, unskilled labor, capital, and population to roll the global economy forward to 2005. This pre-simulation essentially updates the database for 2001 to 2005, the starting point of our projection simulations. It also includes the removal of textile and apparel quotas on exports to Canada, USA, and EU under the Agreement of Textiles and Clothing; China's WTO accession commitments following Ianchovichina and Martin (2004); and the remaining commitments of developing countries under the Uruguay Round using tariff data from Jean, Laborde, and Martin (2005). The efficiency gains in China's motor vehicle sector resulting from WTO accession reforms are captured using productivity shocks as in Ianchovichina and Martin (2004).

Will India's integration into global production networks intensify global competition?

While the examination of trade data above suggests that there is surprisingly little overlap in the export mix of China and India, this might change in light of India's move to greater integration in the world economy. We therefore look at the impact of implementing a well-functioning duty exemption/drawback system in India on the rest of the world by including the very large reductions in protection that have been undertaken in India since 2001; the further reductions in manufacturing sector protection that have been foreshadowed by the government; and measures intended to enable Indian

manufacturers to fully participate in global production sharing. These measures include more effective duty exemptions for intermediates used in the production of manufactured exports, tariff cuts intended to bring tariffs on manufactured products to around the 7% level prevailing in China post-Accession (Ianchovichina and Martin 2004, p11), and reduction in international transport costs to and from India by 20%.[5]

We find that the impact of implementing a well-functioning duty drawback system in India on the world economy is relatively small. This is not surprising given the fact that India's economy is not yet well integrated with the global economy. In 2001 India's share in total intermediate imports of motor vehicles, machinery and equipment, electronics and other manufactures used in the production of exports was 1.7 percent, compared to 10.2 percent for China. India's share in total intermediate imports used in the production of exports[6] was 1.2 percent in 2001.

The effect of implementing duty exemptions successfully and lowering tariffs and transport costs is small at the aggregate level, but significant for some industries in India (Table 2). India's total welfare gain from these reforms is assessed at $5 billion per year (in 2001 dollars), or close to 1 percent of per capita real income. The largest part of this gain in welfare is from transport cost savings ($2.2 billion, nearly half of the welfare gain), followed by $1.6 billion from tariff cuts on manufactured goods, and $1.1 billion from successful implementation of duty drawbacks. Output expansion is strong for the sectors benefiting most strongly from duty exemptions. The electronics sector expands by 35 percent, machinery and equipment by 21 percent, apparel by 13 percent, leather goods by 12 percent, other manufactures by 9 percent, and motor vehicles and parts by 1 percent (Table 2). The sectors producing textiles, metals, chemicals, minerals, wood and paper products contract and their producer prices decline as a result of increased competition from imports (Table 2).

The results suggest that India will likely strengthen its ties with global production chains and expand its trade in manufactured products if duty exemption/drawback arrangements are made more effective, trade is liberalized and logistical efficiency increased. Exports of Indian manufactured products will

[5] The tariff reduction is based on continuation of the rapid liberalization undertaken in India's non-agricultural tariffs in recent years. The reduction in transport costs is based on broad estimates by trade-facilitation experts of the potential cost-reducing impacts of trade facilitation measures.
[6] Source www.gtap.org

expand by 67 percent, with some sectors' volumes of exports more than doubling. For example, the volume of machinery and equipment exports goes up by 168 percent (Table 2), while that of electronics rises by 140 percent. The total volume of imports goes up by 50 percent due to a jump in imports of manufactured goods. Imports of metals, textiles, apparel and other light manufactures more than triple (Table 2). As a result of the expansion of the manufacturing sector, real returns to the factors used most intensively in these sectors – physical and human capital, and unskilled labor – go up by more than 3 percent (Table 2). It should be noted that the results reported here may be overstated because the model does not take into account the policies in India that restrict the movement of labor across industries.

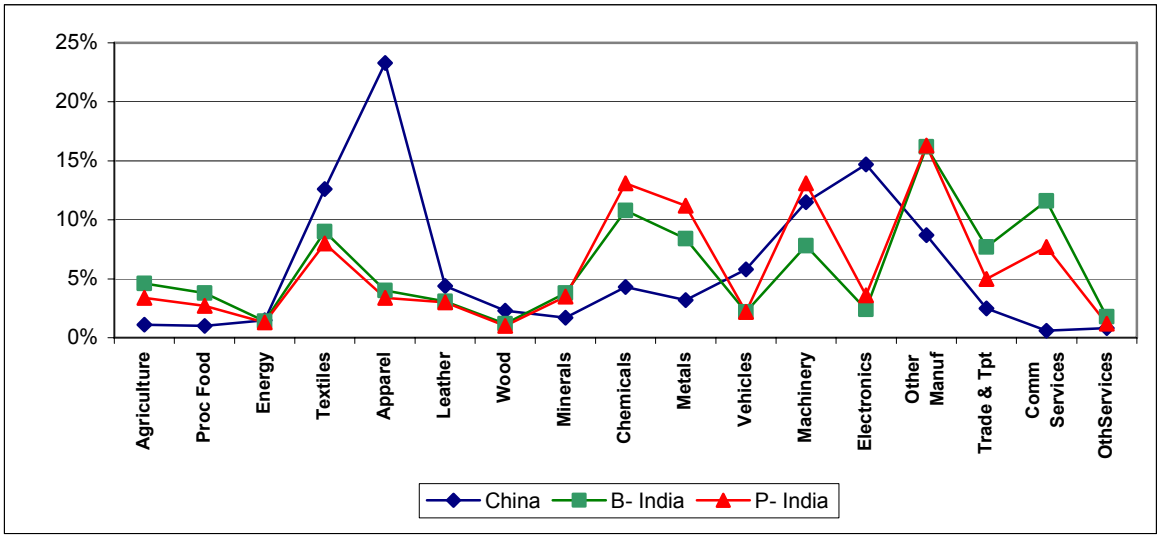
Will the rapid integration of India into global production networks imply increased competition between India and China? Since the most rapid expansion of India's exports occurs in manufactures, one might have expected that this would increase the degree of competition between India and China. But this does not actually happen. In Figure 3, a comparison of the share of each product represented in the model in China's exports (represented by bars) with the corresponding share in India's exports before (B-India) and after the policy reforms (P-India) suggests that these reforms will not expand India's exports of products in which China has particularly large export shares. In fact, the correlation for overall exports rises modestly, from 0.37 to 0.41. However, the correlation within manufactures falls from 0.01 to -0.02 as India expands the exports of products in which China's share is relatively small and vice versa. In only one sector – machinery and equipment – is India expected to increase its exports and intensify competition between the two giant economies. These findings suggest that India's reform efforts to integrate better with the world economy are therefore unlikely to intensify head-on competition between China and India. It is important to note however that the situation might change if labor restrictions in India and financial repression in China are lifted. Then competition in the labor-intensive product markets between the two countries is expected to intensify sharply.

Table 2. The Impact of India's Integration with the World Economy (% changes)

Product	Output	Producer Prices	Exports	Imports
Rice	1.12	0.50	24.83	15.04
Wheat	0.44	0.23	12.71	2.75
Grains	0.14	0.65	0.98	3.48
Vegetables and Fruits	-0.42	0.49	12.15	6.35
Oils and Fats	-1.75	0.10	11.18	8.23
Sugar	0.31	0.73	11.34	13.73
Plant Fibers	-1.89	-0.07	12.05	1.94
Other Crops	-0.10	0.59	8.46	11.46
Livestock and Meat	-0.03	0.76	5.23	9.66
Dairy	0.34	1.01	-6.57	13.80
Other Processed Foods	0.70	0.55	4.37	5.85
Energy	-0.83	-0.87	42.47	-0.20
Textiles	-1.90	-0.83	35.70	234.58
Wearing Apparel	12.78	-0.81	26.55	257.38
Leather	11.57	-1.34	48.70	241.71
Wood and Paper	-8.85	-0.27	30.17	90.69
Minerals	-3.28	-0.62	38.35	46.31
Chemicals, Rubber, & Plastics	-8.82	-3.42	90.22	128.04
Metals	-11.76	-3.25	108.29	209.06
Motor Vehicles and Parts	1.41	-2.31	59.51	30.91
Machinery and Equipment	20.98	-4.42	167.71	41.11
Electronics	34.97	-3.64	140.28	3.18
Other Manufactures	9.41	-3.19	56.48	82.57
Trade and Transport	-0.21	0.43	-1.81	1.51
Commercial Services	0.29	0.30	-0.62	1.46
Other Services	0.36	0.32	-1.09	1.75
Food	*0.02*	*0.55*	*9.85*	*7.23*
Energy and minerals	*-1.50*	*-0.80*	*39.47*	*6.27*
Manufactures	*-0.49*	*-2.74*	*67.63*	*84.17*
Services	*0.14*	*0.36*	*-0.68*	*1.51*
Total	*1.14*	*-1.08*	52.36	50.46
Welfare represented as:	EV in US$ 2001	4989	Per capita utility	0.91
Real returns to:	Capital	3.26	Skilled labor	3.88
	Land	1.70	Unskilled labor	3.28

Source: Authors' simulations with modified GTAP model; see details in text. The simulation includes introduction of duty drawbacks, a drop in manufacturing tariffs to 7%, and a reduction in transport costs to and from India by 20%..

Figure 3. Export Shares in China and India, 2001



Source: Authors' calculations.

Who gains and who loses from growth in China and India?

We next explore the implications of strong growth prospects in China and India in the context of world economic expansion over 2005-2020 (Table 3).[7] This process provides a baseline from which we can assess the impact of an additional 2.1 percentage point annual growth in China, and 1.9 percentage point annual growth in India, in the period 2005-2020. Using the methodology for assessing potential growth impacts of reform presented in Ianchovichina and Kacker (2005), we concluded that these were potentially feasible increases relative to the baseline.[8,9] We implement these growth dividends using favorable, sector-neutral, annual shocks to total factor productivity (TFP) of the same size. These assessments of upside potential are perhaps conservative in that they do not explicitly take into account the potential benefits from reforms of labor market policies in India that are widely believed to have enormous potential for productivity growth and fuller participation in global production chains (Mitra and Ural 2006). Nor do they fully account for the potential benefits of reforms in services trade (Nikomborirak 2006), which Markusen, Rutherford and Tarr (2005) find to be potentially very large.

[7] The forecasts of growth rates for real GDP, skilled and unskilled labor inputs, investment and capital accumulation, and population were based on the 'central projections' for 2005-2015 in the World Bank's Global Economic Prospects database at the time the analysis was undertaken. The methodology for constructing the macroeconomic projections to 2020 (known as the "GTAP baseline") is documented in Walmsley, Dimaranan, and McDougall (2002). The growth rates to 2020 are very close to the World Bank's 'central projections' to 2020 used in Winters and Yusuf (2006).
[8] Ianchovichina and Kacker (2005) present growth scenarios for all developing countries using a cross-country growth model.
[9] The increases in TFP growth can also be interpreted as gains due to increasing returns to scale.

Table 3. Output, Factor Inputs, and Population Projections, 2005-2020 (annual, average growth rates, in percent)

Trading Partner	GDP	Unskilled Labor	Skilled Labor	Physical Capital	Population
Australia and New Zealand	3.5	1.6	0.6	3.8	0.7
China	6.6	0.8	3.9	8.5	0.6
Japan	1.6	0.2	-0.7	2.5	-0.2
Korea	4.7	2.0	5.8	4.9	0.3
Hong Kong and Taiwan, China	4.3	0.6	3.0	4.9	0.4
Indonesia	5.2	2.7	6.5	4.7	1.1
Malaysia	5.6	-1.4	3.9	5.8	1.4
Philippines	3.5	1.8	4.6	3.5	1.5
Singapore	4.9	0.6	1.1	5.3	0.8
Thailand	4.6	0.1	3.2	3.9	0.5
Vietnam	5.4	1.4	1.9	6.0	1.1
Rest of South East Asia	3.1	1.3	3.6	3.6	1.0
India	5.5	1.6	4.0	6.1	1.1
Rest of South Asia	5.0	2.1	3.6	5.1	1.7
Canada	2.6	1.6	0.9	3.2	0.4
USA	3.2	1.5	0.8	3.9	0.7
Mexico	3.8	2.7	4.6	3.3	1.4
Argentina and Brazil	3.6	0.9	3.7	3.1	1.0
Rest of Latin America	3.3	1.6	3.8	3.6	1.3
European Union 25 and EFTA	2.3	0.3	0.0	2.6	-0.1
Former Soviet Union	3.2	0.3	0.8	3.6	-0.1
Middle East and North Africa	4.1	1.7	3.3	4.1	1.6
Sub-Saharan Africa	3.5	2.6	3.3	3.2	1.9
Rest of the World	3.7	0.7	1.2	2.6	0.5
Low income countries	4.7	1.7	3.1	4.2	1.5
Middle income countries	4.5	1.0	3.1	3.9	0.8
High income countries	2.7	0.9	0.4	3.0	0.2
World	3.1	0.9	0.8	3.2	0.9

Source: World Bank projections to 2015 extrapolated to 2020

We then assess the impact of strong growth on the quality and variety of exports from China and India. Quality improvements in exports have recently been identified as a key influence on the performance of rapidly growing exporters such as China and India (Hummels and Klenow 2005). We follow Hummels and Klenow who observe that larger economies export more in absolute terms than smaller economies and analyze the extent to which larger economies export higher volumes of each good (intensive margin growth), a wider set of goods (the extensive margin), and improved-quality goods. Their estimates imply that rising quality in existing product lines accounts for increases of approximately 0.09 percent in export prices for each one percent increase in income levels, despite increases of 0.34 percent in the

quantities exported. Further, they find that 66 percent of the export growth resulting from an increase in income arises from export of new products and exports of existing products to new markets.[10]

In the standard modeling framework in which we work, the number of explicit goods cannot, in fact rise as exports grow. However, both the increase in the number of varieties exported, and the improvements in the quality of goods exported result in increases in the demand for goods contained within each of our standard aggregates. We specify these increases in demand as product-augmenting technical changes that increase the effective quantity of each good in the eyes of the purchaser, and correspondingly lower the effective price of the good to the purchaser. Using the price aggregator dual to Hummels and Klenow's quantity aggregator, we are able to specify the reduction in the effective price associated with their combinations of increases in variety and quality. This price aggregator is:

$$P^* = \left[N.\left(\frac{P}{\lambda}\right)^{(1-\sigma)} \right]^{(1/(1-\sigma))},$$

where P is the actual price of individual commodity exports, N is the number of varieties, λ is the quality index and P^* is the overall effective price of exports. With this, we can calculate the change in the effective price corresponding to a change in real GDP. With an elasticity of substitution σ equal to 7.5,[11] we show that the effective price declines corresponding to the cumulative increases in China's and India's real GDP growth in the high growth scenario relative to the baseline are 9.2 percent and 8.2 percent, respectively. We implement this as a 9.2 percent and an 8.2 percent product-quality-augmenting technical change on imports by other countries from China and India, respectively.

Our simulations of growth and quality improvement include most of the broad features of new economic geography models such as Puga and Venables (1999). Improved variety and quality of exports from China and India raise welfare, and lower production costs in their trading partners, in the same way that increased variety does in the Puga-Venables model—that is through a reduction in the effective price of imports from the expanding country. In our formulation, trading partners also face increased competition in third markets, reducing welfare in their competitors. Induced increases in import demand from China and India improve the terms of trade of their trading partners in our formulation, as in Puga and

[10] Hummels and Klenow (2005) find that the contribution of the extensive margin varies with the levels of aggregation. At the 6-digit level exports of new varieties account for 66 percent of the country differences in exports. At the 1-digit level the variety effect accounts for 15 percent of the country differences in exports.
[11] This is the mid-range value considered in Hummels and Klenow (2005).

Venables. One difference is that increases in exports from trading partners do not increase the number of varieties supplied by these countries, and hence do not generate benefits from the preference for variety assumed in the new economic geography models. For trading partners where welfare declines, but exports increase, our formulation omits a positive effect that may reverse the very small estimated overall negative impact. For markets where both welfare and exports decline, our analysis excludes a negative welfare impact contained in the new economic geography models.

A recent paper by Amiti and Freund (2007) found that new products and new markets were important to China's recent export success but much less so than in Hummels and Klenow (2006). Using highly disaggregated time series data of China's exports to the US (10-digit HS data with over 16,000 codes) and 6-digit HS data on China's export to all countries for the period 1992-2005 and Feenstra's index of variety, they estimated an extensive margin of 31 percent – 15 percent associated with growth in new varieties and 16 percent associated with growth of existing varieties to new markets. This is 35 percentage points lower than the estimate in Hummels and Klenow, but their estimate based on cross-section estimation is not directly comparable with that of Amiti and Freund since the forces that generate product distribution across countries may be quite different from forces at work within countries over time. In addition, the estimate in Hummels and Klenow is an average effect for the 126 exporting countries in their U.N. data for 1995. The time period of the Amiti and Freund (2007) study may also be important. Manole and Martin (2007) found that the growth of non-traditional exports was much more rapid between 1980 and 1992 than in the post-1992 period.

The extensive margin in developing countries other than China is likely to be much stronger than the extensive margin observed for China's exports because in 1992 China's export bundle was already very large and diverse, and overlapped with that of the developed countries much more substantially than one would expect given its level of development or its size (Schott 2007). It is quite plausible that the size of the extensive margin used for India is closer to the estimate in Hummels and Klenow (2006), while that for China may be closer to Amiti and Freund (2007). In addition to the uncertainty about the size of the extensive margin and the strength of purchasers' love of variety there is also uncertainty about the size of the elasticity of substitution between different varieties. Hummels and Klenow (2006) consider estimates that vary between 5 and 10 based on estimates in Hummels (1999), but they also discuss the much lower value of 2.6 in Acemoglu and Ventura (2002) which is close to more recent estimates in

Kee et al. (2007). An elasticity of substitution lower than the one used in this paper (7.5) will enhance the welfare benefits of increased variety--other things equal-- because it implies that goods are more differentiated. The sensitivity of the welfare results to the choice of substitution parameters and the size of the extensive margin are important issues that we plan to examine in future.

Finally, because we do not know the exact channels through which China and India will grow in the next fifteen years, we undertake three simulations that are alternatives to the neutral high-TFP scenarios, and which allow us to investigate whether China and India's export growth might create more competition for developing or for industrial countries. We first study the implications of positive productivity shocks of 2 percent per year in the relatively capital and skill-intensive sectors considered in the case studies of Winters and Yusuf (2006): metals; electronics; machinery and equipment; automobiles, and commercial services in China and India. Then, we consider shocks that augment the stocks of human and physical capital, and could be expected to shift the composition of China's exports towards goods more intensive in human and physical capital, and hence more competitive with the exports of the industrial countries. We first assess the impacts of a 2 percentage point annual increase in the stock of physical capital in China and India. Then, we compute the effects of a 2 percentage point annual increase in the stock of human capital in China and India.

The macroeconomic closure of the simulation model assumes constant employment, perfect mobility of skilled and unskilled labor between sectors, and none between regions. Since we look at long run effects, we have doubled the elasticity of substitution between imported goods from different sources and between composite imported and domestic goods from the values used in the GTAP 6 Data Base.

The effects on key variables of higher growth in China and India, and higher growth with and without increased variety and quality of exports are presented in Table 4. These impacts are presented for real incomes (welfare); for export volumes; and for terms-of-trade effects. For each variable, the effect depends upon whether the income increases in China and India result in intensive-margin growth of the same exports ("Growth"), or whether export growth is accompanied by expansion in the range of products exported, and improvements in their quality ("Growth, Variety and Quality"). Increases in real income presented are measures of equivalent variation in 2001 dollars. Export expansion is presented

using percentage changes in the volume of exports. The terms-of-trade effect is presented in 2001 dollar terms.[12]

A positive efficiency gain in China and India resulting in annual growth that is respectively 2.0 and 1.9 percentage points higher than in the baseline will translate into a welfare gain of US$1.14 trillion for China and $362 billion for India relative to the baseline. The volume of exports increases by 29 percent from both India and China - an increase slightly larger than the corresponding increases in output. However, this export expansion is accompanied by declining export prices and a terms-of-trade loss of about US$48 billion for China and $12 billion for India. Such a terms-of-trade loss is an expected outcome in a model employing the Armington assumption of national product differentiation.

The welfare changes for other countries are relatively small. Gains for most of China's and India's trading partners in the Asia-Pacific region are modest. High income countries gain, except for the European Union, where the interaction of existing distortions and structural change lead to an allocative efficiency loss. Many countries will benefit from improved terms-of-trade for their products as China increases its imports from the rest of the world by 23 percent and India by a similar amount. Some middle and low income countries such as Thailand, the Philippines, as well as other countries in South Asia, will lose as competition with China and India in third markets negatively affects their terms-of-trade.

Whereas the aggregate results suggest that competition from China and India would have a small impact on average real incomes, manufacturing industries in many countries are affected negatively,[13] and for industries in some countries these effects could be substantial (Table 5).[14] Improved growth of exports from China and India implies expansion of their textile industries and contraction of the textile industries in other countries relative to the baseline. Indonesia and Vietnam experience the largest

[12] In our revised model framework where we incorporate product-quality-augmenting technical change, since the price of relevance to the importer is the effective price, which may fall when quality and variety increase, and the price relevant to the producer is the actual price, which rises when quality and variety increase, it is possible for the terms-of-trade to improve for both importer and exporter.

[13] Table 5 reports output changes for the manufacturing sectors in the model. While in some countries all manufacturing sectors contract, some other sectors (not reported in the table) expand as factor inputs move out of the shrinking manufacturing industries into the farm and services sectors.

[14] Results in the case of improved growth in China are available upon request and do not differ much from the results in the case of improved growth in China and India, except for India whose apparel industry contracts by 12 percent, while the impact on other industries is negligible.

contractions of 9.2 percent and 8.9 percent, respectively. The projected growth of China's and India's apparel industries means sharp contractions in apparel production elsewhere. The apparel industries of Vietnam and the Middle East and North Africa are expected to be the hardest hit as their output declines by nearly a fifth (19 percent). Similar declines will plague the light manufacturing industry (leather and other manufactures), although the expected declines are much smaller than the ones affecting apparel. With the exception of the electronics industry in Singapore and Thailand, competition from India and China leads to contractions of the electronic industries in other countries. Machinery and equipment production will also relocate to China and India, reducing the size of these industries in other countries. The expected expansion of the automobile production in China and India has a small negative effect on automobile production in other countries, with the exception of Mexico and Thailand.

But not all will be bad news. The boost in China's and India's wood processing industries has positive spillover effects via increased demand for intermediate wood products from Korea, Indonesia, Malaysia, Thailand, and other countries in East and South Asia. Similarly, growth in China and India will fuel demand for chemicals from the Philippines, Malaysia, and Thailand, mineral products from Vietnam and other South East Asian countries, and metals from some countries in East Asia and South Asia (Table 5).

Adding improvements in the variety and quality of exports from China and India to the high growth scenario increases the benefits to the world economy from $1.6 trillion to $1.8 trillion (Table 4). In this case, the volumes of exports from China and India grow by 55 and 47 percent respectively with positive terms-of-trade effects in all regions other than the Philippines. Most countries benefit since they can import higher volumes from these two countries at lower effective prices and also experience greater demand for their exports from China and India. The biggest beneficiaries are, of course, China and India, whose welfare increases by US$1.3 trillion and US$0.4 trillion, respectively. The volume of trade between China and India increases more than does either's trade with the rest of the world, deepening the trade links between the two Asian giants.

Pressure on middle-income developing countries to raise the quality of their exports will increase as a result of improved-quality Chinese and Indian exports. Without efforts to keep up with China and India, some countries – most notably the Philippines, Mexico, Vietnam and others in South East Asia – may

see their export shares eroded.[15] Improved quality exports from fast-growing China and India imply that competition in the markets for different manufactured goods will intensify and lead to further contractions of the electronics industry in all regions except Singapore and Thailand, the machinery and equipment industries in all countries except the Philippines, the textile, apparel and other light manufacturing sectors in most regions. As China starts producing more sophisticated and new varieties of electronics, machinery and equipment, it reduces the rate of expansion of its processing industries (wood, mineral, chemical and metals) leaving space for other countries to expand these industries (Table 5).

[15] In only one case – the Philippines – the welfare loss from improved growth in China and India worsens as China and India improve the quality of their exports and expand output of electronics, machinery and equipment (Table 5). Such an outcome can be explained with the high share of electronics in the Philippines' total exports. Indeed, this share is higher than that of any other country/region in the model.

Table 4. Impacts of Improved Growth and Quality Exports in China and India, (relative to base, 2020)

	Welfare				Exports		Terms-of-Trade Effects	
	Growth		Growth, Variety & Quality		Growth	Growth, Variety & Quality	Growth	Growth, Variety & Quality
Regions	2001 $m	%	2001 $m	%	%	%	2001 $m	2001 $m
Australia & N Zealand	2743	0.45	5568	0.91	-0.06	0.72	2652	5240
China	1145733	39.9	1253425	43.6	29.41	55.34	-48229	38159
Japan	6588	0.16	17276	0.42	2.44	4.80	9186	18946
Korea	829	0.11	7451	1.00	3.45	5.83	-957	4646
Hong Kong/Taiwan	3811	0.53	12749	1.78	1.94	3.78	4260	13307
Indonesia	791	0.27	1822	0.61	0.18	-0.10	723	1907
Malaysia	1555	0.87	3636	2.03	0.27	0.02	1570	3698
Philippines	-627	-0.57	-994	-0.89	-0.26	-3.19	-559	-583
Singapore	-2280	-1.68	-458	-0.34	4.92	6.50	-159	2019
Thailand	-639	-0.31	492	0.24	1.63	2.33	-857	312
Vietnam	-41	-0.07	166	0.29	-1.10	-2.33	63	468
Rest of S E Asia	424	0.41	603	0.58	-2.85	-2.11	382	541
India	361740	33.7	394490	36.7	28.89	47.05	-12379	10661
Rest of South Asia	-962	-0.35	-159	-0.06	1.60	2.98	-1110	-517
Canada	2767	0.32	5182	0.59	-0.91	-1.43	2634	4736
USA	124	0.00	20262	0.15	0.67	2.87	479	20671
Mexico	535	0.06	1000	0.11	-1.33	-2.37	175	489
Argentina and Brazil	1410	0.13	3134	0.28	-0.06	0.45	1072	2570
Rest of Latin America	3015	0.36	4703	0.56	-0.48	-0.26	2652	4251
EU 25 & EFTA	-4306	-0.04	16893	0.18	-0.14	-0.18	3013	22183
Former Soviet Union	9958	1.37	12914	1.77	1.34	2.34	9750	12039
M East & North Africa	23780	1.31	29108	1.60	-1.50	-1.50	22592	27568
Sub-Saharan Africa	4904	0.96	7676	1.50	-0.24	0.80	4004	6439
Rest of the World	-688	-0.34	-500	-0.24	1.46	2.37	-596	-282
Low inc. ctries (LICs)	*366065*	*17.9*	*402775*	*19.7*	*14.04*	*23.44*	*-9039*	17592
Mid inc. ctries (MICs)	*1184823*	*13.1*	*1308743*	*14.5*	*10.70*	*20.39*	*-11707*	90130
High income countries	*10275*	*0.03*	*84923*	*0.28*	*0.79*	*1.73*	*21109*	91749
World	**1561163**	**3.8**	**1796437**	**4.3**	**4.4**	**8.5**	**363**	**199472**
LICs (excl India)	*4325*	*0.46*	*8286*	*0.87*	*-0.07*	*0.77*	*3339*	*6931*
MICs (excl China)	*39091*	*0.61*	*55315*	*0.87*	*-0.18*	*-0.16*	*36522*	*51971*

Source: Authors' simulations with modified GTAP model; see details in text..

Table 5. Manufacturing: Effects of Improved Growth in China and India (percent relative to base, 2020)

Regions	Textiles	Apparel	Leather	Wood	Minerals	Chemicals	Metals	Auto	Machinery	Electronics	Other
Australia &	-6.9[a]	-8.6	-8.5	-1.3	-1.1	-0.8	-4.1	-2.4	-6.7	-5.9	-8.4
New Zealand	*-15.3*[b]	*-15.5*	*-13.7*	*-1.5*	*0.2*	*-3.4*	*-3.9*	*-6.3*	*-13.9*	*-18.5*	*-15.3*
China	35.5	20.3	39.4	41.6	36.8	42.9	38.5	34.8	37.6	35.8	30.5
	30.0	*20.5*	*45.2*	*34.7*	*36.3*	*39.2*	*34.8*	*40.9*	*40.2*	*58.2*	*33.1*
Japan	-1.6	-6.0	-5.3	-1.1	-1.0	-2.3	-2.7	-3.9	-6.6	-4.8	-4.2
	15.1	*-8.0*	*-8.1*	*-1.0*	*-0.6*	*-1.4*	*-1.9*	*-6.6*	*-9.0*	*-10.7*	*-6.8*
Korea	-1.3	-2.1	-1.6	0.4	-0.6	-1.7	1.7	-3.0	-1.9	0.0	-7.7
	10.0	*-3.7*	*10.6*	*4.1*	*-0.8*	*2.7*	*3.9*	*-9.2*	*-7.0*	*-7.9*	*-11.7*
Hong Kong	-5.9	-7.3	-7.1	-2.2	-1.7	-4.8	-5.0	-3.6	-5.7	-2.9	-15.8
& Taiwan*	*1.7*	*-1.0*	*-4.3*	*-2.5*	*-3.9*	*-2.2*	*-8.8*	*-10.0*	*-10.7*	*-10.6*	*-26.3*
Indonesia	-9.2	-11.7	-7.7	4.6	-2.6	0.3	-5.9	-0.5	-1.2	-1.4	-10.6
	-15.6	*-21.4*	*-20.0*	*15.4*	*-3.4*	*0.9*	*-8.9*	*-2.8*	*-4.4*	*-12.0*	*-19.2*
Malaysia	-7.5	-15.8	-5.7	0.6	-1.3	1.9	-1.6	-1.1	-4.6	-0.2	-3.6
	-7.3	*-27.4*	*-4.2*	*5.1*	*0.5*	*4.4*	*1.2*	*-2.4*	*-5.9*	*-3.5*	*-5.5*
Philippines	-7.4	-15.7	-8.7	-0.2	-0.3	3.9	0.1	0.0	-0.2	-4.0	-6.4
	-14.3	*-25.7*	*-17.0*	*1.9*	*1.3*	*5.5*	*2.6*	*0.4*	*4.0*	*-13.9*	*-9.9*
Singapore	-8.0	-8.1	-11.2	-0.6	2.1	0.7	2.0	-3.6	-1.8	3.4	-10.9
	-7.9	*-16.9*	*-21.7*	*1.6*	*3.9*	*0.8*	*5.0*	*-11.4*	*-2.5*	*5.2*	*-20.3*
Thailand	-5.1	-5.0	-6.0	1.5	-0.6	2.0	0.5	0.5	-1.4	4.6	-8.1
	-9.1	*-9.5*	*-13.9*	*6.5*	*0.3*	*3.0*	*2.2*	*0.3*	*-3.7*	*6.2*	*-15.5*
Vietnam	-8.9	-19.3	-5.6	-0.9	0.3	-1.1	-4.9	-4.7	-7.7	-4.8	-6.6
	-15.6	*-35.5*	*-11.9*	*-0.1*	*1.0*	*2.4*	*-8.4*	*-8.0*	*-12.8*	*-12.6*	*-10.4*
Rest of	-6.3	-3.6	-3.4	0.7	0.7	-0.5	-1.2	-0.4	-3.5	-0.5	-0.8
S. East Asia	*-12.4*	*-6.2*	*-5.6*	*9.1*	*1.4*	*-2.4*	*-2.1*	*-1.1*	*-6.0*	*-2.4*	*-1.2*
India	35.1	23.3	41.4	39.8	30.7	30.6	33.9	30.6	29.2	30.7	23.5
	26.2	*11.1*	*45.5*	*32.1*	*33.9*	*33.1*	*34.0*	*30.0*	*41.5*	*36.5*	*15.6*
Rest of	-2.7	-12.4	-1.2	0.7	-1.6	-0.4	3.8	-1.5	-3.2	-0.2	-6.4
South Asia	*-6.4*	*-25.5*	*-6.3*	*2.3*	*-1.9*	*-1.2*	*10.5*	*-3.8*	*-8.1*	*-8.9*	*-11.6*
Canada	-4.4	-8.3	-3.7	-1.4	-2.4	-4.0	-2.1	0.0	-4.1	-2.2	-12.7
	-5.8	*-14.9*	*-3.7*	*-1.1*	*-2.6*	*-3.8*	*-4.3*	*-1.0*	*-8.5*	*-11.0*	*-20.5*
USA	-5.4	-8.7	-4.3	-0.2	0.1	0.9	-0.7	-0.2	-2.5	-3.5	-10.5
	-10.5	*-15.3*	*-6.4*	*0.3*	*0.2*	*1.4*	*-1.0*	*-0.4*	*-4.2*	*-11.0*	*-16.7*
Mexico	-2.1	-2.2	-0.8	0.2	0.1	0.9	-0.3	0.7	-4.1	-3.8	-6.5
	-3.9	*-3.6*	*-1.3*	*1.2*	*0.8*	*1.6*	*0.4*	*2.0*	*-5.7*	*-13.2*	*-10.1*
Argentina &	-2.0	-1.1	-6.6	-1.0	-1.0	-2.0	-3.2	-1.8	-4.5	-3.1	-2.9
Brazil	*-3.4*	*-1.8*	*-8.4*	*-0.9*	*0.0*	*-2.8*	*-4.5*	*-2.5*	*-7.4*	*-8.0*	*-4.9*
Rest of Latin	-4.5	-4.2	-3.4	-0.5	-0.2	-0.3	-2.8	-1.3	-5.5	-5.3	-8.8
America	*-9.5*	*-7.9*	*-6.1*	*0.4*	*1.1*	*-1.4*	*-2.6*	*-2.5*	*-9.9*	*-15.1*	*-14.4*
EU 25 &	-5.6	-9.7	-5.0	0.0	-0.4	-1.8	-0.7	-0.4	-2.4	-2.5	-3.9
EFTA	*-9.9*	*-16.8*	*-8.5*	*0.8*	*-0.5*	*-3.0*	*-1.3*	*-1.3*	*-5.0*	*-11.7*	*-6.6*
Former	-2.6	-4.7	-1.4	-0.5	-1.9	-1.1	-3.3	-0.3	-4.4	-3.1	-3.2
Soviet Union	*-5.8*	*-9.4*	*-4.2*	*0.8*	*-2.2*	*-1.6*	*-2.9*	*0.1*	*-7.9*	*-6.6*	*-5.7*
Middle East	-8.6	-18.6	-2.6	-0.7	-0.5	-5.8	-6.6	-3.2	-8.3	-7.2	-9.1
& N. Africa	*-14.8*	*-29.4*	*-3.7*	*-0.7*	*0.3*	*-5.9*	*-6.5*	*-4.9*	*-12.9*	*-15.9*	*-13.4*
Sub-Saharan	-4.6	-5.5	-4.1	0.0	-0.1	0.3	-2.3	-3.8	-8.4	-7.4	-7.6
Africa	*-10.4*	*-10.3*	*-7.7*	*0.6*	*1.2*	*-2.0*	*1.4*	*-8.5*	*-16.1*	*-24.9*	*-13.3*
Rest of	-2.9	-7.7	-1.7	1.1	-0.1	0.0	-1.2	-0.3	-1.9	-1.8	-14.3
the World	*-5.3*	*-12.9*	*-4.1*	*2.5*	*-0.1*	*-1.4*	*-2.6*	*-0.7*	*-4.7*	*-7.0*	*-24.0*

Source: Authors' simulations with modified GTAP model; see details in text.

* Hong Kong, China and Taiwan, China.

[a] For each partner numbers in the first row are results for the case of improved growth in China and India.

[b] For each partner numbers in the second row are results for the case of improved growth and quality exports in China and India.

A positive productivity shock of 2 percent per year in the five Chinese and Indian sectors considered in Winters and Yusuf (2006) – metals, electronics, machinery and equipment, motor vehicles and commercial services – is beneficial to the world and all developing countries except the Philippines (Table 6). However, this efficiency improvement in China and India entails substantial structural change (Table 7). China and India become much more powerful players in these sectors and world trade grows much faster than envisaged under the scenario of neutral total factor productivity (TFP) growth of 2 percent. Exports from China double and exports from India jump by more than 72 percent. World trade expands by 11 percent, as regional trade between China and developed economies in the Asia Pacific region (Japan, Korea, and US), and India and its closest partners in South Asia will grow as well. The huge effects on trade arise because the assumed stimulus is to existing export sectors, so it exacerbates imbalances between local supply and demand and hence requires increased trade to restore equilibrium.

Under this scenario China and India expand their heavy industry and high-tech manufacturing sectors, leaving space for other countries to increase production of light manufactures, chemicals, and minerals (Table 7). Still, exports from many developing economies that compete with China and India decline as a result of the improved efficiency of China's and India's heavy industries, and high-tech manufacturing sectors. Most notable is the decline of exports from the Philippines (18 percent) and Thailand (10 percent), whose electronics sectors declines by 65 percent and 53 percent, respectively. All economies experience structural change of a similar magnitude. China and India shift out of textiles and light manufactures, whereas the rest of the economies shift out of heavy and high-tech manufactures.

Improved growth through accelerated accumulation of capital (2 percentage points faster than the baseline) benefits China and India, and modestly affects real incomes in other regions (Table 6). China and India increase their production of all manufactured goods, but the expansion of the capital-intensive sectors is larger than that of other sectors. Since the capital-intensive sectors are the sectors experiencing efficiency gains in the previous scenario, the export and sector specific changes are similar but smaller in absolute value than the ones presented for the case of improved efficiency of China's and India's metals, electronics, machinery and equipment, motor vehicles and commercial services in Table 7.

Finally, improved growth through accelerated accumulation of human capital (2 percentage points per year higher than the baseline) has a much smaller effect on welfare, exports, and sector outputs than

improved growth through accelerated accumulation of physical capital (Table 6). This is the case because the share of skilled labor is much lower than the share of capital in total factor endowment.

Concluding Remarks

This study highlights the very sharp differences in the trade patterns of India and China and assesses the implications of rapid growth and structural change on the trade patterns of China, India and the rest of the world. The paper shows that services exports are roughly twice as important for India as for China. Within merchandise trade, both are dependent on manufactures, with China much more strongly integrated into production networks through trade in parts and components. However, their product mixes are radically different, with only one product—refined petroleum—appearing in the top 25 products for both. Each country has undergone quite radical trade reform.

The impact of implementing a well-functioning duty drawback system in India on the world economy is negligible but it is significant for some Indian industries. India's reform efforts to integrate better with the world economy are unlikely to intensify head-on competition between China and India. Indeed, our growth analysis suggests there is scope for China and India to strengthen their trade ties and expand their exports and imports significantly without hurting each other's development prospects or those of other economies. However, improved growth in China and India will intensify competition in global markets for manufactures, and the manufacturing industries in many countries will be affected negatively. Improvement in the range and quality of exports from both countries has the potential to create substantial welfare benefits to the world, and to each other, and to act as a powerful offset to the terms-of-trade losses otherwise associated with rapid export growth. Without efforts to keep up with China and India, some countries may see further erosion of their export shares and high-tech manufacturing sectors. As China starts producing more sophisticated and new variety manufacturing products, there will be opportunities for other countries to expand their processing industries.

Table 6. Export Volume (%) and Welfare ($m) Changes under Various Scenarios (percent)

Regions	Improved Sector Productivity in China & India	Improved Capital Growth in China & India	Improved Skilled Labor Growth in China & India	Improved Sector Productivity in China & India	Improved Capital Growth in China & India	Improved Skilled Labor Growth in China & India
	%	%	%	$m	$m	$m
Australia and New Zealand	-0.01	0.14	0.02	13374	4551	969
China	96.42	23.93	5.39	955700	313357	114804
Japan	4.40	2.97	0.66	32689	8031	1327
Korea	4.05	3.25	0.82	8747	-1242	-480
Hong Kong & Taiwan, China	-3.88	1.15	0.32	30073	2443	454
Indonesia	-0.73	0.12	0.05	6785	909	155
Malaysia	-6.60	-0.36	-0.04	8719	2076	375
Philippines	-18.34	-0.82	-0.06	-2673	-836	-185
Singapore	-8.56	3.87	1.03	5451	-2470	-678
Thailand	-9.77	0.46	0.15	3812	-503	-171
Vietnam	3.23	-0.49	-0.07	2551	85	13
Rest of South East Asia	14.02	-0.27	-0.16	1348	476	98
India	72.90	35.06	6.92	204856	145872	39982
Rest of South Asia	13.40	2.60	0.56	3424	-1184	-328
Canada	-6.96	-1.21	-0.27	12841	4138	828
USA	5.07	1.82	0.38	41423	-223	-1318
Mexico	-8.74	-1.39	-0.31	4404	736	69
Argentina and Brazil	1.33	0.50	0.08	9681	1768	317
Rest of Latin America	0.00	-0.23	-0.07	12600	3786	800
European Union 25 & EFTA	-2.45	0.00	0.01	79052	-4586	-2524
Former Soviet Union	4.44	2.27	0.52	17683	11342	2571
Middle East & North Africa	-0.62	-1.40	-0.33	51396	27207	6287
Sub-Saharan Africa	-2.24	-0.59	-0.16	13405	5720	1291
Rest of the World	12.42	3.19	0.75	1321	-608	-142
Low income countries (LICs)	*35.50*	*16.51*	*3.25*	*225582*	*150968*	*41056*
Middle income countries (MICs)	*32.42*	*8.33*	*1.88*	*1069427*	*359234*	*124881*
High income countries	*-0.43*	*1.01*	*0.24*	*223651*	*10642*	*-1423*
World	11.13	3.94	0.88	*1518660*	*520843*	*164514*
LICs (excl India)	*2.61*	*0.13*	*0.01*			
MICs (excl China)	*-2.24*	*-0.11*	*-0.02*			

Source: Authors' simulations with modified GTAP model; see details in text.

Table 7. Industry Effects of Improved Sectoral Productivity Growth in China and India (percent)

Regions	Textiles	Apparel	Leather	Wood	Minerals	Chemicals	Metals	Auto	Machinery	Electronics	Other
Australia&New Zealand	10.4	38.7	9.4	3.1	15.8	-0.9	-42.7	-28.5	-44.0	-61.8	25.6
China	-79.6	-72.8	-63.6	-52.3	-0.6	-45.6	42.7	195.8	95.4	252.1	-58.0
Japan	48.3	36.5	30.5	9.1	16.8	22.5	-19.3	-23.1	-31.6	-43.9	28.2
Korea	61.4	40.5	125.8	51.2	27.4	47.0	-32.2	-29.5	-36.2	-54.5	104.2
Hong Kong & Taiwan*	1.6	107.2	28.1	9.6	2.6	8.0	-51.6	-40.0	-56.0	-66.3	94.9
Indonesia	38.7	96.2	-2.0	37.0	-7.5	-1.1	-45.7	-26.8	-38.1	-77.9	37.6
Malaysia	99.2	290.7	63.1	88.9	44.1	53.8	-19.2	-12.4	-23.0	-53.2	44.4
Philippines	71.9	266.3	44.2	22.3	4.2	16.1	-40.6	-25.0	-23.9	-64.7	81.3
Singapore	70.4	36.6	29.4	29.9	51.3	30.6	-31.5	-39.0	-42.0	-35.0	48.5
Thailand	54.2	59.4	26.6	35.6	16.4	8.9	-34.4	-14.8	-39.5	-53.3	69.7
Vietnam	48.9	203.1	-5.1	-0.3	6.0	13.5	-41.7	-39.0	-53.2	-57.9	14.9
Rest of S. East Asia	20.8	26.4	-5.6	21.1	3.4	-3.0	-23.4	-12.7	-29.1	-28.2	2.9
India	-40.5	-67.5	-88.7	-43.8	-37.8	-41.7	117.5	26.2	156.2	8.7	-71.4
Rest of South Asia	23.3	156.1	5.3	5.0	2.4	2.5	-39.2	-40.0	-48.2	-64.8	20.0
Canada	54.7	94.6	49.7	12.0	3.5	12.4	-30.2	-27.5	-37.6	-60.4	100.6
USA	36.6	81.0	33.7	5.8	6.8	14.8	-14.7	-13.7	-24.2	-56.6	77.3
Mexico	57.0	75.0	20.6	8.0	5.0	13.8	-13.6	-16.0	-33.0	-65.0	70.8
Argentina & Brazil	6.0	4.3	28.6	2.3	13.4	-0.9	-20.6	-20.8	-27.8	-36.3	8.5
Rest of Latin America	22.3	43.8	11.7	4.6	10.7	0.2	-34.7	-27.5	-40.3	-61.6	34.9
EU 25 & EFTA	72.1	111.4	38.1	9.1	4.9	6.4	-24.5	-28.0	-37.1	-62.2	44.2
Former Soviet Union	16.5	50.2	8.2	17.2	-10.6	5.9	-26.3	-9.9	-26.0	-30.4	10.1
Middle East & N. Africa	30.2	173.0	2.9	-1.6	7.1	-2.6	-38.2	-32.8	-47.8	-63.9	38.7
Sub-Saharan Africa	17.0	32.2	12.4	6.6	13.2	7.1	-45.8	-41.1	-50.0	-70.4	30.1
Rest of World	45.1	155.0	15.2	4.3	-7.0	-3.8	-30.1	-25.3	-31.7	-45.7	125.4

Source: Authors' simulations with modified GTAP model; see details in text.
*Hong Kong, China and Taiwan, China.

Efficiency improvements in China's and India's high-tech and heavy industries have much stronger trade effects than a uniform efficiency improvement of the same magnitude. This scenario will lead to severe competition in the high-tech sectors and entail substantial structural change with China and India displacing other countries in markets for high-tech products, but leaving space for other countries to increase production of light manufactures.

Some caveats are important. First, these are thought experiments and not precise predictions. While they show that China's and India's growth could be beneficial to nearly all other countries, and that the impact on particular countries will depend on those countries' own trade, production and consumption profiles and on the patterns of growth in China and India, they offer only the broadest indications of likely effects. Likewise, our results strongly suggest that benefiting will depend on adapting to the new opportunities and challenges. But by themselves these results cannot dictate the necessary adjustment. They must be supplemented with sector-specific case studies both to identify the emerging patterns in general and to consider particular products, as well as services which we did not discuss in the analysis of growth and trade effects. Our aggregation hides important information on intra-industry trade in components as part of the global production sharing arrangements.

Note that the adjustment costs of this economic transformation could be substantial, but are not factored into the analysis. Finally, recall also that the paper focuses on the static trade aspects of growth in China and India; it ignores important investment-growth linkages that may amplify the effects discussed here and affect the welfare results.

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